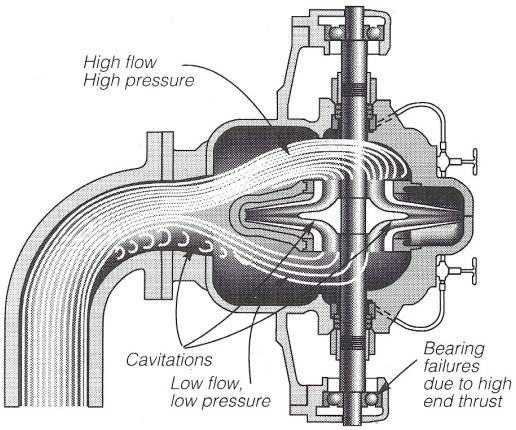
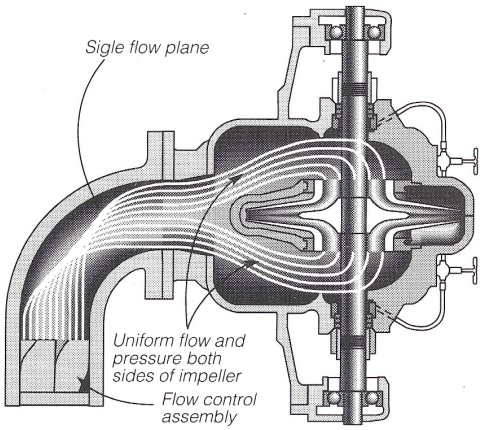
Power

DESIGN/OPERATING IDEAS

Flow modifier boosts condensate-pump output





New York State Electric & Gas Corp (Nyseg) recently overcame a condensate flow problem that was limiting full-load output from Unit 8 at its Goudey station. Both of the unit's condensate pumps were designed for 100% capacity, but only one could meet the plant's full-load needs. The other was deficient in both flow capacity and head.

After studying the problem, engineers determined that the degraded performance was related partially to the pump and partially to the suction piping configuration. A piping elbow, located just upstream of the pump suction, produced flow irregularities. Flow separation in the elbow resulted in turbulence and secondary flows which carried over into the pump inlet (figure, above, left). As a result, one side of the pump's double-suction impeller received a greater amount of flow than the other. In addition, the starved side received a highly turbulent and potentially damaging flow, impairing performance.

After several repair attempts failed to fully solve the problem, a consultant from Encor-America Inc, Mountain View, Calif, suggested installing a "rotation-vane" device just upstream of the elbow to improve inlet flow dynamics (photo). The rotation vane consists of a fixed set of vanes which impart a swirl to the flow entering the elbow. The swirling motion enables the flow to negotiate the turn without excessive shear between adjacent streamlines and eliminates flow separation (figure, above, right). The device was developed by Cheng Fluid Systems Inc, Sunnyvale, Calif.

After the rotation vane was installed, flow through the pump increased from 836 to 854 gal/min, total head from 229 to 232 ft. As a result, unit load increased from 75.9 to 77 MW when operating on the previously deficient pump. Since its installation in September 1991, the rotation vane has performed well and has required no maintenance.

Other possible benefits/applications of the device include: (1) increasing flow metering accuracy by improving flow distribution, (2) eliminating check-valve chatter, (3) reducing elbow erosion in two-phase or slurry flows, (4) increasing flow rates and reducing pressure-head losses in piping systems, (5) reducing noise and vibration in piping systems, and (6) eliminating water hammer. ■